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09/903,244	07/11/2001	Takasuke Hayase	14757	9495

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EXAMINER

DEO, DUY VU NGUYEN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 05/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/903,244

Applicant(s)

HAYASE ET AL.

Examiner

DuyVu n Deo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 6-11 is/are rejected.
- 7) ☒ Claim(s) 2-5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng et al. (US 5,741,624) and admitted prior art.

Jeng describes a method for reducing photolithographic steps in a semiconductor interconnect process comprising steps of: depositing a plurality of films, 14 and 16, to form a laminated films on a substrate; forming a resist pattern 34 having a plurality of film thickness on the laminated film; etching the laminated films using the resist pattern as first etching mask; etching the resist pattern to remove the thinner portion of the resist pattern; etching the laminated film second time sing the remaining portion of the resist as a second mask (col. 3, line 45-68; col. 4, line 38-col. 5, line 13; figures 4-7). Unlike claimed invention, Jeng doesn't describe the method for manufacturing an active matrix. However, as described in pages 4-5 of the specification, the active matrix includes interconnect process to form contact holes for electrical interconnection. Therefore, it would have been obvious at the time of the invention for one skilled in the art that Jeng's method can be used to form interconnection for an active matrix because his method reduces photolithographic steps in forming contact hold for electrical interconnection.

Referring to the limitation of forming the laminated film on an insulating substrate. As described by Jeng, in col. 3, line 65-68, that there are more layers not shown under the laminated films and there layers would includes insulating layers as they are materials for forming an IC, integrated circuit (col. 1, line 18-20, 36-37). Admitted prior art further shows an IC such as active matrix substrate that includes insulating substrate (page 3, line26). Therefore, at the time of the invention, depending on the type of IC being manufacturing, the laminated films can be formed on insulating layers (claimed insulating substrate since they would be part of the substrate formed under the laminated films) in order to produce an IC such as an active matrix substrate with a reasonable expectation of success.

Referring to claim 7, the resist pattern has a plurality of film thickness and if formed by exposing a resist film once through a photomask 42 that emits light at different dosage and the exposed portions of the resist are removed through development process. The mask pattern 42 consisting of a portion 60 having a 0% transmissivity (claimed a light shielding portion), portion 56, which emits a lesser light dosage, from 5-95% transmissivity and depending o the desired depth differential to be formed in the resist layer (this portion 56 would reads on claimed a light half-transmitting portion), and a portion 58 where light is not block as shown by figure 4 where all of the resist exposed through portion 58 is removed (this portion 58 reads on claimed a light transmitting portion) (figures 3, 4; col. 4, line 24-45; col. 5, line 45-10).

3. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng and admitted prior art as applied to claim 1 above, and further in view of Batra et al. (US 6,200,906).

Unlike claimed invention (claim 9), applied prior art above doesn't describe forming different thickness in the resist film by exposing sequentially the resist film using a photomask

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selected from photomasks with different mask patterns from each other for each exposure. Batra describes a method of forming different thickness in the resist film by exposing the resist film using either one photomask or sequentially exposing the resist film two photomasks with different mask patterns from each other for each exposure (col. 5, line 58-col. 6, line 5). It would have been obvious for one skilled in the art at the time of the invention that using either one or two photomasks with different mask patterns from each other for each exposure are well known in the art as shown by Batra. They are equivalent in forming resist pattern with different thickness. Therefore, using two photomasks with different mask patterns from each other for each exposure would be obvious in order to form resist pattern with different thickness with a reasonable expectation of success.

Referring to claim 10, as shown by Jeng's above, in order to form different thickness in the resist, each thickness is formed with different amount of exposure light (figures 3 and 4). Therefore, it would have been obvious to one skilled in the art to use different amount of exposure light for each exposure in order to form a resist pattern with different thickness.

Referring to claims 8 and 11, Batra further describes using two resist films laminated having different exposure sensitivity from each other (col. 5, line 55-57). At the time of the invention, using two resist films is known to one skilled in the art and would be obvious in order to form a resist pattern with a plurality of film thickness for etching of the films in the manufacturing of semiconductor structure.

4. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng and admitted prior art as applied to claim 1 above, and further in view of Bartha et al. (US 5,635,337).

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Referring to claim 6, Jeng is silent about etching the thinner portion of the resist pattern by anisotropic etching using plasma enhancing a halogen compound gas and an oxygen gas. Bartha describes a method for etching the resist by anisotropic etching using plasma etch reactor (claimed plasma-enhancing) a halogen compound, CF₄, and oxygen (col. 4, line 56-60; col. 6, line 16-30). It would have been obvious for one skilled in the art to etch the resist in light of Bartha because Bartha further describes technique that is silent by Jeng in order to etch the resist and form a second mask for the subsequent step.

Allowable Subject Matter

5. Claims 2-5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 2 is allowable because applied prior art doesn't describe at least two films of the laminated films in the opening are etched and removed in the first etching step.

Drawings

6. Figures 2, 6B, and 7B should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

7. The claims are objected to because the words are crowded too closely together, making reading and entry of amendments difficult. Substitute claims with spaces between the words are suggested.

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Specification

8. The specification is objected to because the words are crowded too closely together, making reading and entry of amendments difficult. Putting spaces between the words are suggested.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD

April 30, 2003

JD